United States Patent [19]

Sato et al.

[11] **Patent Number: 4,611,937**

[45] **Date of Patent: Sep. 16, 1986**

[54] **RIBBON FEED MECHANISM FOR A PRINTER**

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[73] Assignee: **Silver Seiko Ltd.,** Kashiwazaki, Japan

[21] Appl. No.: **570,637**

[22] Filed: **Jan. 13, 1984**

[30] **Foreign Application Priority Data**

Jan. 19, 1983 [JP] Japan 58-5797

[51] **Int. Cl.**[4] **B41J 32/00**

[52] **U.S. Cl.** **400/208;** 400/120; 400/225; 400/229; 400/233; 400/234; 400/236

[58] **Field of Search** ..... 400/120, 185, 194, 195, 400/196, 196.1, 207, 208, 208.1, 222, 225, 229, 231, 233, 234, 320, 322, 335, 236; 192/12 BA, 41 S; 346/76 PH

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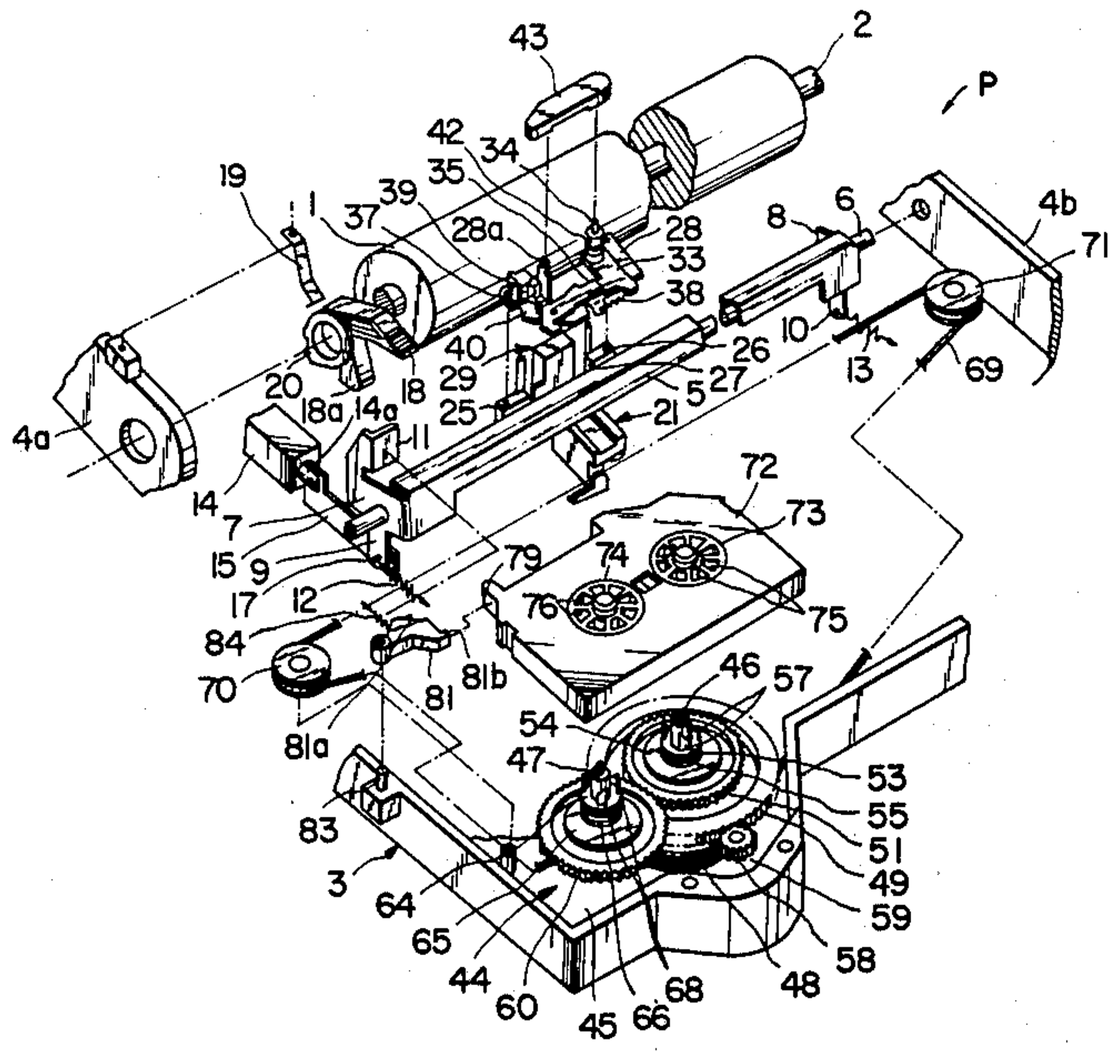
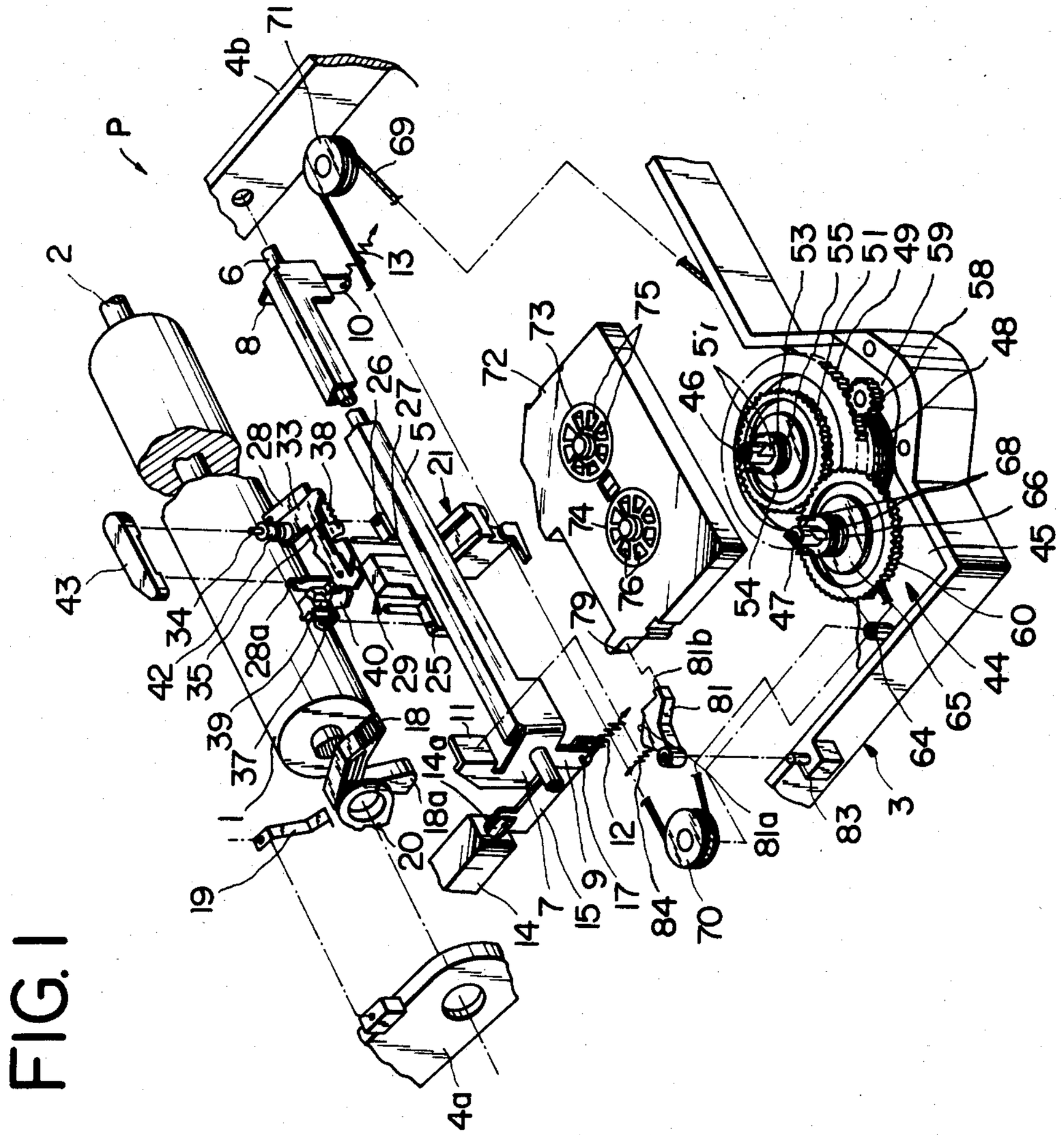
Attorney, Agent, or Firm—Ziems, Walter & Shannon

[57] **ABSTRACT**

A printer having a print ribbon feed mechanism is disclosed which allows optimal feeding of a print ribbon, eliminating unnecessary consumption of the ribbon. The mechanism includes first and second clamp means mounted on a stationary section and a print carrier of the machine, respectively, which are both controlled in accordance with movement of a print head from and to a print enabling position. Means are provided which are connected to a carrier indexing mechanism for impositively driving print ribbon supply and takeup spools disposed on the stationary section to wind a print ribbon onto them during a carrier return operation whereas they allow the ribbon to be unwound from the ribbon spools when the carrier advances.

19 Claims, 6 Drawing Figures

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81a
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FIG. 1

FIG. 2

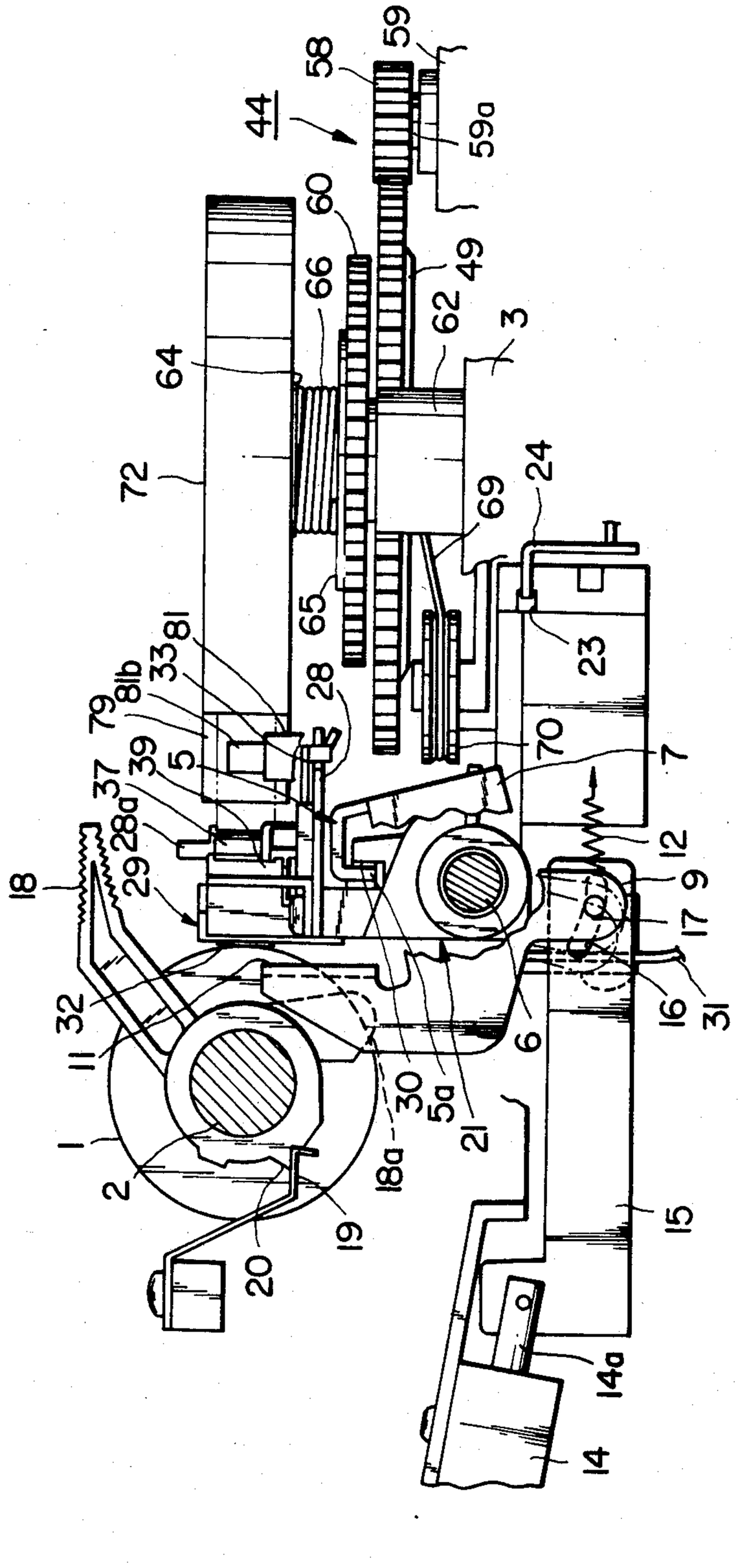
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FIG. 3

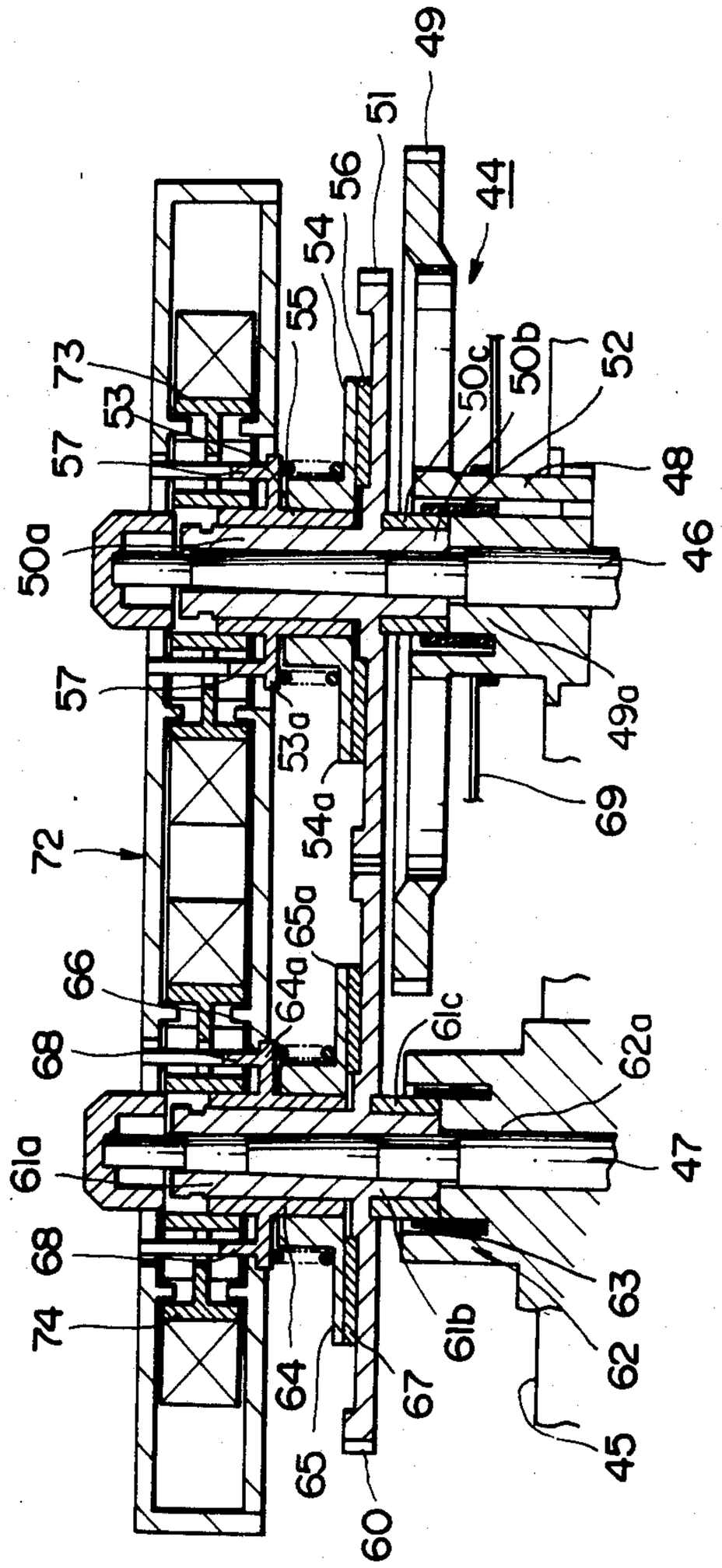
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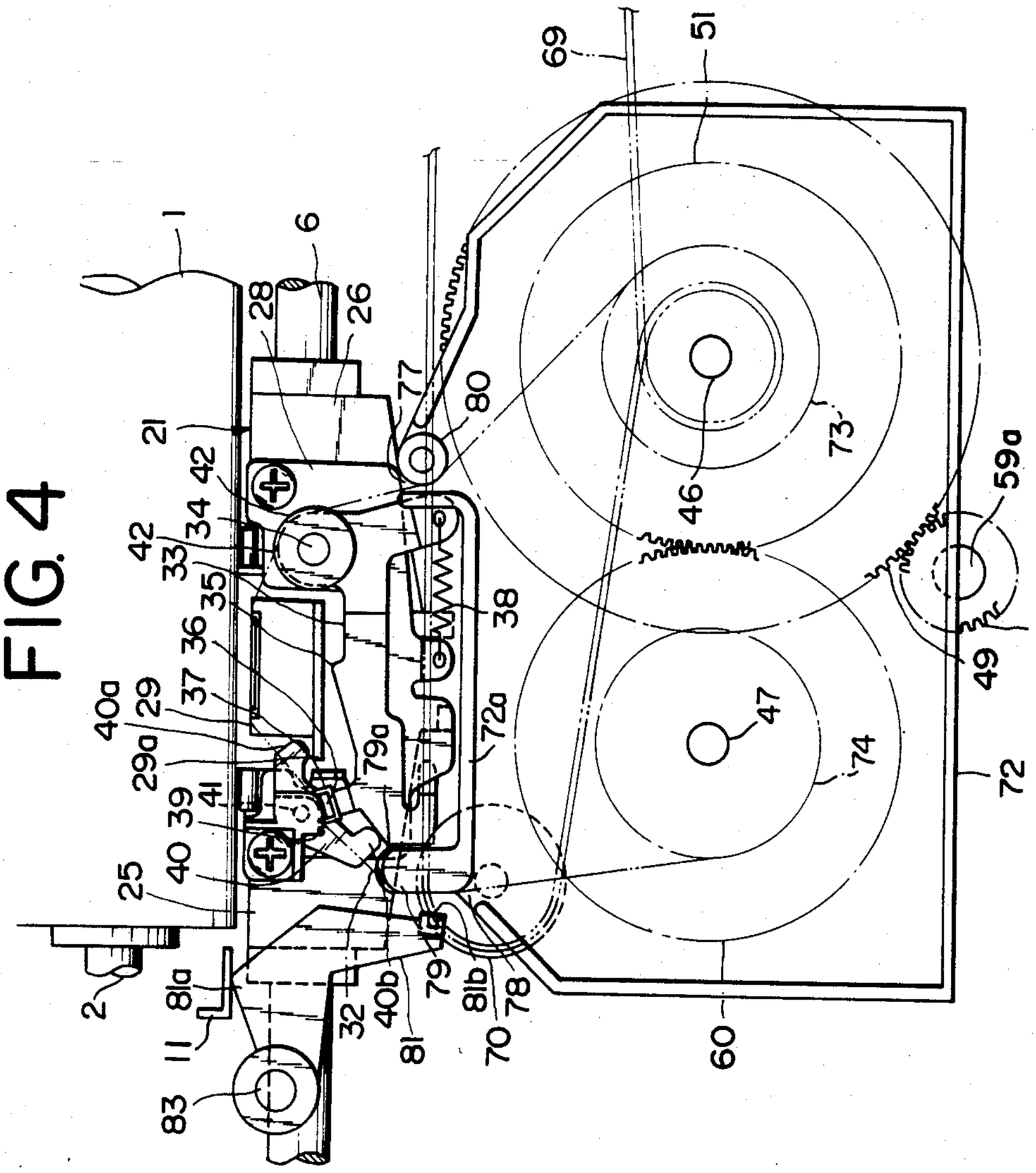
FIG. 4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81a
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40b
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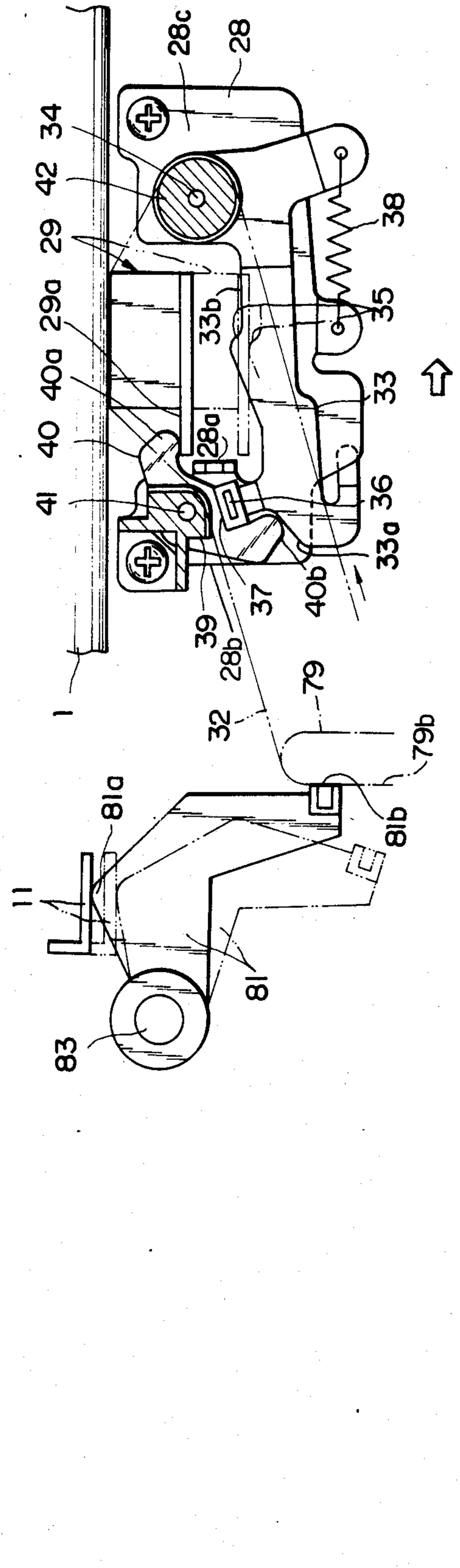
FIG. 5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81b
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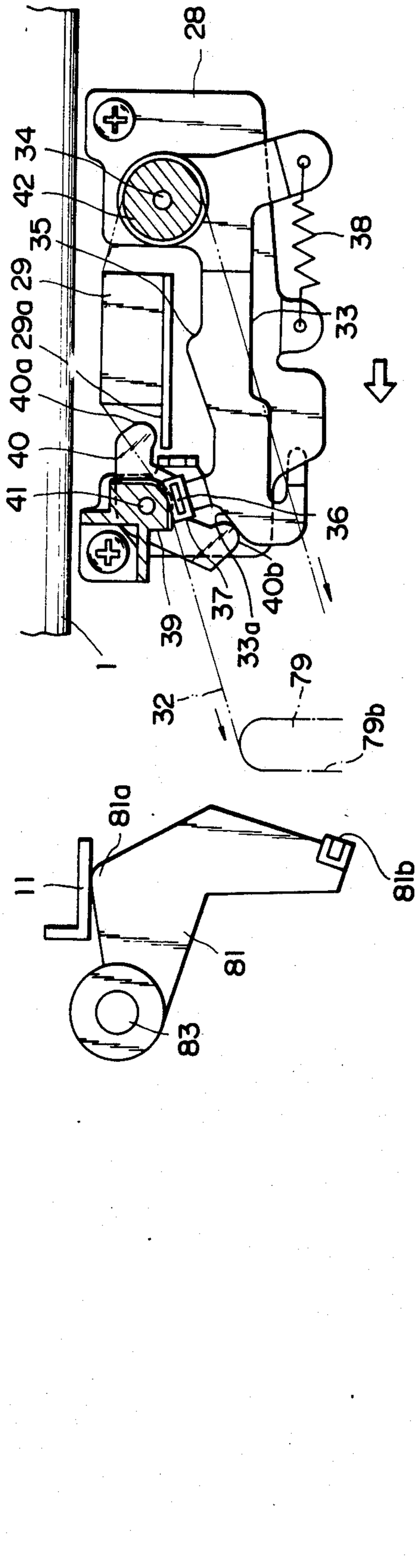
FIG. 6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81a
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81b
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RIBBON FEED MECHANISM FOR A PRINTER

BACKGROUND OF THE INVENTION

This invention relates to a printer or typewriter, and more particularly to a printer or typewriter in which a ribbon supply is mounted on a stationary section of the machine and a print ribbon is passed through a print head on a carrier and is fed in relation to movement of the carrier.

In a printer or typewriter of the type described, and especially in a thermal printer or typewriter which has a thermal print head on a carrier, a print ribbon such as a ribbon having thermally transferrable ink thereon is fed an extent corresponding to a distance of and in a direction opposite to the direction of translatory movement of the carriage as the carriage advances to print a line of characters on a medium supported on a platen, or in other words, a print ribbon is fed in such a manner as to provide no relative movement between the medium and the print ribbon. If otherwise there is some relative movement between them, then ink once transferred to the medium will be diffused over the medium due to such relative movement and will blur the medium, resulting in poor print. A print ribbon feeding mechanism which attains such a print ribbon feeding manner as described just above is disclosed in a U.S. Pat. No. 3,855,448 and especially by an embodiment of FIG. 5 of the patent. This mechanism includes a clamp provided at a stationary section of the machine for clamping a used portion of a print ribbon while a print head is advancing, and a one-way roller provided on the carrier which allows the print ribbon to pass the same when the carrier advances but prevents the ribbon from passing in the opposite direction so that it draws out the ribbon from a supply reel when the carrier is returned to its leftmost end position while the ribbon is wound onto a takeup reel correspondingly. This arrangement, however, is somewhat disadvantageous in that a print ribbon is "fed" wastefully even when a carriage advances without printing any character, that is, without using the print ribbon, such as in a spacing or tabbing operation, since the print ribbon is fed an extent equal to a distance over which the carrier advances. Further, if a takeup reel is not appropriately driven to takeup a print ribbon in timed relationship with returning movement of the carrier in any position of the reel, then the ribbon may be either pulled so heavily to break or slackened between the takeup reel and the one-way roller to cause jamming. The patent, however, does not disclose any solution to this problem.

SUMMARY OF THE INVENTION

It is an object of the present invention to provide a printer having a print ribbon feed mechanism which provides a solution to such problems of conventional ribbon feed mechanisms and allows optimal feeding of a print ribbon, eliminating unnecessary consumption of the print ribbon.

It is another object of the invention to provide a new and efficient thermal ink transfer ribbon feed mechanism which can be advantageously employed in a thermal ink transfer printer in which a thermal transfer ink ribbon is used.

Other objects, advantages and features of the present invention will become apparent from the following detailed description of a preferred embodiment of the

invention given in conjunction with the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** is a partly cutaway exploded perspective view of part of a printer according to the present invention;

FIG. **2** is an enlarged left-hand side elevational view, partly in section, of the printer of FIG. **1**;

FIG. **3** is a vertical sectional view of a ribbon feed mechanism of the printer of FIG. **1**;

FIG. **4** is a plan view showing an ink ribbon fed through a carrier in a left limit position; and

FIGS. **5** and **6** are rather enlarged plan views, in diagrammatic representation, showing an ink ribbon and a print head in different positions.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring to FIG. **1**, a printer, indicated generally by the reference character P, includes a platen **1** extending horizontally between and supported at its opposite ends thereof on left and right side walls **4***a* and **4***b* of a frame **3** (partially illustrated for reasons of clarity) or stationary section of the printer P. A transverse operating bail **5** is rotatably supported on and extends across a major length of a rod **6** which extends in front of and in parallel relationship to the platen **1** between the side walls **4***a* and **4***b*. The operating bail **5** has bearing portions **7** and **8** at its opposite ends thereof at which it is supported on the rod **6**. The bearing portion **7** has a lower lug **9** and an upper bent lug **11** formed on the lower and upper sides thereof, respectively. Tension springs **12** and **13** are connected to the spring hanger lugs **9** and **10**, respectively, to urge the operating bail **5** counterclockwise about the rod **6**. A pin **17** is secured to the lower lug **9** of the operating bail **5** and is received in an arcuate slot **16** formed in a forward end portion of a link **15** which is pivotally connected to the forward end of a plunger **14***a* of a solenoid **14**. Thus, if the solenoid **14** is energized, the link **15** will be pulled back to rotate the operating bail **5** clockwise about the rod **6** against the urging of the springs **12** and **13**.

A manually operable level **18** is supported for pivotal motion on a left end portion of a shaft **2** of the platen **1** and has a lower extension portion **18***a* which is positioned adjacent the bent lug **11** of the operating bail **5**. A leaf spring **19** is secured to the side wall **4***a* and is resiliently abutted against a circumferential projection **20** formed on a bearing portion of the lever **18** to retain the lever **18** in any of its angular positions around the platen shaft **2**. In one of the angular positions of the lever **18**, the lower extension **18***a* is spaced from the bent lug **11** of the operating bail **5**, and if the lever **18** is then turned counterclockwise in FIG. **2**, the lower extension **18***a* of the lever **18** will be engaged to press the bent lug **11** to pivot the operating bail **5** clockwise against the springs **12** and **13**.

A carrier **21** is supported at a lower rear portion thereof for sliding motion on the rod **6**. The carrier **21** is substantially in L-shape in side view and has a recess **23** formed at a front end portion thereof (FIG. **2**). A linear encoder **24** extends through the recess **23** of the carrier **21** between the side walls **4***a*, **4***b* of the frame **3**. A support plate **28** of a substantially U-shape in plan is screwed to the carrier **21** and extends over a recess **27** formed between a pair of riser portions **25** and **26** at opposite lateral ends of a rear end portion of the carrier **21** as shown in FIG. **1**, and an upstanding post **28***a* is

provided on the left side of the support plate **21**. A cap **43** is mounted, at its left end, on the remote end of the upstanding post **28***a* and, at its right end, on the upper end of a pin **34**, designated more fully below.

A thermal print head **29** of a substantially rectangular shape in front elevation is supported at a lower end thereof for sliding motion on and for pivotal motion about the rod **6** and is located in position within the recess **27** of the carrier **21** so as to allow integral lateral movement thereof with the carrier **21** along the rod **6**. The print head **29** has a column of heater or thermal elements (not shown) mounted thereon and electrically connected to a signal source (not shown) so as to be selectively energized to heat to allow ink to be transferred from a print ribbon **32** to a medium (not shown) supported on the platen **1** to effect printing of a character, as hereinafter described. The structure and configuration of the thermal elements and signal source for selectively energizing the thermal elements are well known in the art. A lateral slit **30** is formed in a portion of the print head **29** adjacent the riser portions **25**, **26** of the carrier **21** and a downwardly bent rear marginal edge **5***a* of the operating bail **5** extends through the slit **30** of the print head **29** so as to allow the print head **29** to be pivoted back and forth about the rod **6** by the operating bail **5**. A flexible flat cable **31** is connected to the print head **29** to provide for energization of the thermal elements on the print head **29**.

Referring now to FIG. **2**, when the lever **18** is its forwardmost position, as seen in FIG. **2**, and the solenoid **14** is not energized, the operating bail **5** assumes, under the urging of the springs **12**, **13**, a position in which the print head **29** is resiliently pressed against the platen **1** as seen also from FIG. **5** (this position of the print head **29** will be hereinafter referred to as an "operative position"). In the operative position, the print head **29** can effect printing as hereinafter described. If, on one hand, the solenoid **14** is energized, then the link **15** will be pulled back against the the springs **12**, **13** to pivot the carrier **21** clockwise about the rod **6** thereby to pivot the print head **29** in the same direction away from the platen **1** (this pivoted position of the print head **29** will be hereinafter referred to as a "first inoperative position). In the first inoperative position of the print head **29**, printing operation cannot be effected actually. On the other hand, if the lever **18** is manually pivoted counterclockwise about the platen shaft **2**, then the operating bail **5** will be pivoted clockwise about the rod **6** to pivot the print head **29**, e.g., to the first inoperative position. The leaf spring **19**, acting on the projection **20** of the lever **18**, will retain the lever **18** and hence the print head **29** in the pivoted position and the first inoperative position, respectively. If the lever **18** is pivoted further in the same direction, then the print head **29** will be further pivoted away from the platen **1** to an allowable limit position (this position is indicated by phantom in FIG. **5** and will be hereinafter referred to as a "second inoperative position").

A lever **33** is located on the support plate **28** of the carrier **21** and is mounted at the right rear end **28***c* thereof for pivotal motion on a pin **34** on the support plate **28**. The lever **33** has a projection **35** formed at the center of a rear marginal edge **33***b* thereof. A friction member **37** made of a frictional substance such as rubber is secured to a finger **36** formed at a left rear end portion of the lever **33**. The lever **33** is urged to pivot in a clockwise direction in FIG. **4** about the pin **34** by a tension spring **38** so as to press the friction member **37** thereon against a guide member **39** secured to the left rear end **28***b* of the support plate **28**. In this position of the friction member **37** and/or the lever **33**, which will be hereinafter referred to as a "clamping position", a print ribbon **32** is normally clamped between the friction member **37** and the guide member **39**.

Another lever **40** generally of a triangular shape is mounted at a central portion thereof for pivotal motion on a pin **41** extending between support plate **28** and the guide member **39**. A projection **40***a* at the right end of the lever **40** is located adjacent a rear face of a leftward extension **29***a* of the print head **29** and another projection **40***b* at the left end of the lever **40** is located adjacent an oblique rear edge **33***a* of a left end portion of the lever **33**. Thus, when the print head **29** is brought into the aforementioned operative position from, for example, the aforementioned first inoperative position, the lever **40** is pressed at the right end projection **40***a* thereof by the extension **29***a* to pivot in a counterclockwise direction about the pin **41** in FIG. **5**, whereupon the lever **33** is pushed by the left end projection **40***b* of the lever **40** and is rotated in a counterclockwise direction about the pin **34** in FIG. **5** against the urging of the spring **38**, displacing the friction member **37** from the clamping position into a releasing position (FIG. **5**) in which the print ribbon **32** is clear of and free from the friction member **37**. On the contrary, if the print head **29** is brought out of the operative position, then the lever **33** is permitted to be pivoted clockwise about the pin **34** into the clamping position as seen in FIGS. **4** and **6** by the urging of the spring **38** thereby to pivot the lever **40** clockwise about the pin **41**.

A guide roller **42** is also supported for rotation on the pin **34**, and a cap **43** is mounted at the top of the pin **34** and of a post **28***a* erected in a left rear portion of the support plate **28**.

Referring now to FIGS. **1** to **3**, a ribbon feed mechanism, generally designated at **44**, is provided adjacent the left front corner of the printer P. The ribbon feed mechanism **44** includes a pair of shafts **46** and **47** secured to a base plate **45** of the printer frame **3** in a spaced relationship from each other. A gear **49** is rotatably mounted on a lower portion of the shaft **46** and has a wire drum **48** integrally formed therewith. The gear **49** is meshed with a drive gear **58** (see FIG. **4**) mounted on an output power shaft **59***a* of a stepping motor **59** which is mounted on the printer frame **3**. Another gear **51** is also rotatably mounted on an upper portion of the shaft **46** and has upper and lower cylindrical hubs **50***a* and **50***b* integrally formed therewith. A spring clutch **52** is mounted on and extends over a sleeve member **50***c* secured to the lower hub **50***b* of the gear **51** and an adjacent hublike portion **49***a* of the gear **49**, as best shown in FIG. **3**. The spring clutch **52** is arranged to transmit clockwise rotation of the gear **49** and counterclockwise rotation of the gear **51** to the gears **51** and **49**, respectively, but allows no transmission either of counterclockwise rotation of the gear **49** or of clockwise rotation of the gear **51**. Inner and outer flanged wheels **53** and **54** are rotatably mounted on the upper hub **50***a* of the gear **51** and the former is fitted in the latter in a manner of splined coupling (not specifically illustrated) so as to provide for integral rotation and axial displacement relative to each other. The inner wheel **53** has four fingers **57** extending upwardly from the top thereof. An annular friction member **56** made of a hard felt material is interposed between the flange **54***a* of the wheel **54** and the gear **51** and a compression spring **55** is interposed

between the flanges **53***a* and **54***a* of the inner and outer wheels **53** and **54** to urge the wheel **53** axially upwardly away from the other wheel **54** and to urge the wheel **54** axially downwardly to press the annular friction member **56** against the gear **51** so as to allow integral rotation between the gear **51** and the wheels **53** and **54**.

A gear **60** similar to the gear **51** is rotatably mounted on the shaft **47** and is meshed with the gear **51** so that energization of the motor **59** will rotate the gear **60** through the gears **58** and **49**. The gear **60** has cylindrical upper and lower hubs **61***a* and **61***b*. A spring clutch **63** is mounted on and extends over a sleeve member **61***c* secured to the lower hub **61***b* of the gear **60** and a hub-like portion **62***a* of a support **62** secured to the base plate **45**. The spring clutch **63** is arranged to allow counterclockwise rotation of the gear **60** but allows no clockwise rotation of the same and hence allows no counterclockwise rotation of the gear **51** meshed with the gear **60**. Inner and outer wheels **64** and **65** having flanges **64***a* and **65***a*, similar to the inner and outer wheels **53** and **54**, respectively, are mounted rotatably on the upper hub **61***a* of the gear **61** and an annular friction member or wheel **67** is interposed between the gear **60** and the flange **65***a* of the outer wheel **65**. A compression spring **66** is interposed between the inner and outer wheels **64** and **65** to urge the wheels **64**, **65** axially away from each other thereby to press the annular friction member **67** against the gear **60**. The inner wheel **64** has four fingers **68** extending upwardly from the top thereof.

An endless wire or cable **69** is secured at an intermediate portion thereof to the carrier **21** and extends substantially linearly between and around pulleys **70** and **71** which are rotatably mounted adjacent both side walls **4***a*, **4***b* of the printer frame **3**, respectively. The wire **69** further extends from the pulleys **70**, **71** to the wire drum **48** of the gear **49** around which it is wound in several turns. Thus, when the gear **49** is rotated by energization of the motor **59**, the carrier **21** is moved to the right or left across the rod **6**.

Referring to FIGS. **3** and **4**, as the motor **59** is energized to rotate the gear **58** in the clockwise direction in FIG. **4**, the gear **49** is rotated in the counterclockwise direction about the shaft **46** thereby to move the carrier **21** and the print head **29** in the rightward or forward direction. But, this rotation of the gear **49** will not be transmitted to the gear **51** due to the arrangement of the spring clutch **52** as described hereinabove. On the contrary, as the motor **59** is energized to rotate the gear **58** in the counterclockwise direction, the gear **49** is rotated in the clockwise direction thereby to move the carrier **21** and the print head **29** in the leftward or backward direction. The spring clutch **52** now transmits this rotation of the gear **49** to rotate the gear **51** in the same or clockwise direction. The gear **51** in turn rotates the gear **60** in the counterclockwise direction, this rotation of the gear **60** being allowed by the spring clutch **63** as described hereinabove.

Referring now to FIGS. **1** to **4**, a ribbon cassette **72** may be mounted in position on the ribbon feed mechanism **44**. The ribbon cassette **72** has a supply spool **73** and a takeup spool **74** contained therein. Both spools **73**, **74** have axial sectoral holes **75** and **76** formed therein, and when the ribbon cassette **72** is set in position, the fingers **57** and **68** of the inner wheels **53** and **64** extend into the sectoral holes **75**, **76** of the spools **73**, **74**, respectively, as seen from FIG. **3**. Accordingly, if the inner wheel **53** or **64** is rotated, the spool **73** or **74** will be rotated thereby. The cassette **72** has openings **77** and **78** formed in a spaced relationship in a rear cassette wall **72***a* (FIG. **4**) to allow a print ribbon **32**, which may be a thermal ink transfer ribbon, to go out of and come back into the ribbon cassette **72**, respectively. A rearwardly projected guide nose **79** is located adjacent the left opening **78** and has a rounded face **79***a* for guiding the print ribbon **32**, while a guide roller **80** also for guiding the ribbon **32** is rotatably mounted in the right opening **77**. Thus, the print ribbon **32** extends from the supply spool **73**, passing the guide roller **80**, going out of the cassette **72** from the opening **77**, passing the guide roller **42**, the print head **29** then the rounded face **79***a* of the guide nose **79** of the cassette **72**, coming into the cassette **72** through the opening **78**, to the takeup spool **74**, as seen from FIG. **4**.

The ribbon cassette **72** is constructed and located such that, when the carrier **21** is in the allowable leftmost limit position, the carrier **21** extends within a lateral range defined by the two openings **77** and **78** of the ribbon cassette **72** in order to facilitate replacement of the ribbon cassette **72** with another replacement ribbon cassette **72**, as described hereinafter.

A lever **81** is pivotally mounted on an upright pin **83** secured to the side wall **4***a* and is urged to pivot in a counterclockwise direction about the pin **83** by a tension spring **84** (FIG. **1**). Thus, when the print head **29** is in the operative position and hence the lug **11** of the operating bail **5** is in the rearmost position, the lever **81** is abutted at an end face **81***b* thereof by a flat side face **79***b* of the rearwardly projecting guide nose **79** of the ribbon cassette **72** to clamp the print ribbon **32** therebetween (this position of the lever **81** will be hereinafter referred to as a "clamping position"). But, if the operating bail **5** is pivoted to bring the print head **29** to the first inoperative position from the operative position, then the lug **11** of the operating bail **5** will be engaged to push the lever **81** to pivot clockwise against the urging of the spring **84** to a position in which the end face **81***b* thereof is spaced from the flat side face **79***b* of the guide nose **79** of the ribbon cassette **72**, as seen in FIG. **4**. If the operating bail **5** is further pivoted to bring the print head **29** to the second inoperative position, then the lever **81** will be further pivoted to provide a greater distance between the end face **81***b* of the lever **81** and the flat side face **79***b* of the guide nose **79** of the ribbon cassette **72**, as seen in FIG. **6** (the last two positions of the lever **81** will be hereinafter referred to as a first releasing position and a second releasing position, respectively).

When a new ribbon cassette **72** is to be set in position, e.g., in place of an old or used up ribbon cassette **72**, the carrier **21** may be brought to the leftmost limit position as seen in FIG. **4** and the lever **18** will be manually pivoted to its rearmost position to bring the print head **29** and hence the lever **33** to the second inoperative position and the second releasing position to bring the lever **81** to its second releasing position, as seen from phantom in FIG. **5**, respectively. Then, in this position, after removal of the old cassette **72** which may have been on the ribbon feed mechanism **44**, a new ribbon cassette **72** will be placed in position and a portion of a print ribbon **32** outside the cassette **72** may be threaded to pass around the roller **42**, between the print head **29** and the platen **1**, between the the friction member **37** and the guide member **39**, and between the end face **81***b* of the lever **81** and the guide nose **79** of the ribbon cassette **72**. In this position, the lever **18** will now be pivoted to its forwardmost position. As a result, the print head **29** will be brought to its operative position to

hold a portion of the ribbon **32** against a medium (not shown) on the platen **1** and hence the lever **33** will be brought to its first releasing position while the lever **81** will be brought to its clamping position thereby to clamp another portion of the ribbon **32** between the end face **81***b* thereof and the flat side face **79***b* of the guide nose **79** of the ribbon cassette **72**, as shown in full lines in FIG. **5**, to allow subsequent printing operation by the print head **29**. However, it is to be noted that, if a latching solenoid (not shown) is advantageously employed alternatively for the solenoid **14**, then the print head **29** may be arrested in the first inoperative position when the solenoid **14** is not energized, as shown in full lines in FIG. **4**.

When a character or symbol is to be printed, the stepping motor **59** is energized to advance the carrier **21** by increments corresponding in number to columns constituting each or the one character, and at each incremental position, heating elements (not shown) arranged in a column on the print head **29** are selectively energized to allow dot images of ink to be transferred to the medium or paper (not shown) on the platen **1** from the ribbon **32**, as well known to those skilled in the art. During such movement of the carrier **21**, the ribbon **32** is clamped by and between the end face **81***b* of the lever **81** and flat side face **79***b* of the guide nose **79** of the ribbon cassette **72**, and hence, as the carrier **21** advances, a tensile force is applied to the ribbon **32** to urge it to unwind from and rotate the supply spool **73** in the counterclockwise direction in FIG. **4**. Thereupon, the urging force acts to rotate the wheels **53** and **54** and the gear **51** in the counterclockwise direction, but since the gear **51** is held from counterclockwise rotation due to the arrangement of the spring clutch **63**, only the wheels **53** and **54** are allowed to be rotated clockwise together with the supply spool **73** by the urging force due to a slip between the outer wheel **54** and the friction member **56**. As a result, when the carrier **21** advances in the rightward direction for printing a character, the print ribbon **32** is unwound and supplied from the supply spool **73** by an extent corresponding to (that is, substantially twice of) a distance over which the carrier **21** moves.

On the other hand, when the carrier **21** advances rightwardly while no printing operation is effected, such as in a spacing or a tabbing operation, the solenoid **14** is energized so that the print head **29** and the lever **81** are held in their respective first inoperative positions releasing the print ribbon **32** while the lever **35** takes the clamping position, as seen in FIG. **4**. Thus, during such movement of the carrier **21**, the print ribbon **32** is clamped at a portion thereof by and between the lever **33** and the guide member **39**, and hence a tensile force is applied to the ribbon **32** to unwind the ribbon **32** from the supply spool **73** and also from the takeup spool **74**. As a result, the ribbon **32** is allowed to be supplied, on one hand, from the supply spool **73** in a similar manner as described above, but by an extent substantially equal to a distance over which the carrier **21** advances since here the print ribbon **32** is clamped on the carrier **21**. On the other hand, the tensile force to unwind the ribbon **32** from the takeup spool **74** urges the spool **74** and hence the wheels **64** and **65** as well as the gear **60** in the clockwise direction about the shaft **62**. Since the gear **60** is held from clockwise rotation by the arrangement of the spring clutch **63**, only the takeup spool **74** and the wheels **64** and **65** are allowed to rotate in the clockwise direction due to the arrangement of the friction member **67**, thereby discharging the ribbon **32** from the spool **74** substantially by the aforementioned extent, In this way, during movement of the carrier **21** without printing operation, the print ribbon **32** is not moved or fed relative to the print head **29**, thereby decreasing consumption of or saving the print ribbon **32**.

Also during returning movement of the carrier **21** in the leftward direction, the solenoid **14** is energized to position the print head **29** and the lever **81** in the respective first inoperative positions and the lever **33** in the clamping position, as seen in FIG. **6**. But now, the motor **59** is energized to rotate the gear **49** in the reverse or clockwise direction in FIG. **4**. Thus, as the carrier **21** moves backwards, the supply spool **73** is rotated clockwise to take up the ribbon **32** thereon correspondingly. On the other hand, clockwise rotation of the gear **51** rotates the gear **60** and as a result the takeup spool **74** is rotated in the counterclockwise direction to take up the ribbon **32** thereon.

Whether the print ribbon **32** is supplied from or taken up onto any of the supply and takeup spools **73** and **74**, the gear **51** and/or the gear **60** are rotated a sufficient amount to take up the ribbon **32** by an extent much greater than a distance of movement of the carrier **29**, but the arrangement of the frictional members **56** and **67** allows the ribbon **32** to be taken up only by a required distance, keeping the ribbon **32** taut between the carrier **21** and the ribbon cassette **72**.

It is to be understood that the abovedescribed embodiment is merely illustrative of the invention. Numerous other arrangements may be derived by those skilled in the art without departing from the spirit and scope of the invention. For example, while in the embodiment described above the gear **49** which is connected to the motor **59** and has the wire drum **48** for the carrier indexing wire **69** is mounted in coaxial relationship with the supply spool **73** and the wheels **53** and **54**, the gear **49** may otherwise be mounted in coaxial relationship with the takeup spool **74** and the wheels **64** and **65**. In this modification, the direction of rotation of the motor **59** and the winding direction of the wire **69** will be reversed and the spring clutch **52** will cooperate with a portion of the stationary section **45** of the machine. It is thus contemplated that all such variations and modifications are to be construed in accordance with the following claims.

What is claimed is:

1. In a printer having a stationary section, a platen on said stationary section, a bidirectional drive means on said stationary section, a carrier operatively connected to said drive means for back and forth translatory movement thereby to and from a left margin position along said platen, a print head mounted for translatory movement together with said carrier, and a ribbon feed mechanism including a supply spool and a takeup spool for feeding a print ribbon past said print head, the improvement wherein said ribbon feed mechanism comprises:

first clamp means mounted on said stationary section and selectively operable between an operative position in which said first clamp means clamps a first portion of the print ribbon between said print head and said takeup spool and an inoperative position in which said first clamp means clamps no portion of the print ribbon;

second clamp means mounted on said carrier and selectively operable between an operative position in which said second clamp means clamps another portion of the print ribbon between said supply

spool and said first portion of the print ribbon and an inoperative position in which said second clamp means clamps no portion of the ribbon;

means for selectively actuating said first and second clamp means and operable throughout the range of back and forth translatory movement of the carrier between a first actuating position in which said first clamp means and said second clamp means are actuated to respective operative and inoperative positions and a second actuating position in which said first and second clamp means are actuated to respective inoperative and operative positions;

first ribbon driving means disposed for rotation about a first axis fixed relative to said stationary section and operatively connected to said drive means for impositively driving said supply spool to wind the print ribbon onto said supply spool when said drive means operates to move said carrier toward said left margin position and for unwinding the print ribbon therefrom when said drive means operates to move said carrier away from said left margin position; and

second ribbon driving means disposed for rotation about a second axis fixed relative to said stationary section and operatively connected to said drive means for impositively driving said takeup spool to wind the print ribbon onto said takeup spool when said drive means operates to move said carrier toward said left margin position and for unwinding the print ribbon therefrom when said drive means operates to move said carrier away from said left margin position.

2. A printer as claimed in claim **1**, wherein said first ribbon driving means includes a friction coupling having a first rotatable member and a second rotatable member on which said supply spool is supported, said first and second rotatable members being disposed in frictional engagement with each other, and a one-way clutch disposed between said drive means and said first rotatable member of said friction coupling.

3. A printer as claimed in claim **2**, wherein said second ribbon driving means includes a friction coupling having a first rotatable element operatively connected to said drive means and a second rotatable element on which said takeup spool is supported, said first and second rotatable elements being disposed in frictional engagement with each other, and a one-way clutch disposed between said first rotatable element and said stationary section, said one-way clutch of the second ribbon driving means operative to hold said first rotatable element against rotation in a direction that unwinds the print ribbon from said take-up spool.

4. A printer as claimed in claim **3**, wherein said second rotatable element of said second ribbon driving means includes a first part on which said takeup spool is supported, a second part mounted for integral rotation on and axial movement relative to said first part, and a compression spring interposed between said first and second parts for urging said second part into frictional engagement with said first rotatable element of said second driving means.

5. A printer as claimed in claim **2**, wherein said one-way clutch is a spring clutch.

6. A printer as claimed in claim **3**, wherein said one-way clutch of the second ribbon driving means is a spring clutch.

7. A printer as claimed in claim **1**, wherein said first ribbon driving means includes a stepping motor, a first gear mounted on an output shaft of said motor, a second gear mounted for rotation about said first axis and meshed with said first gear, said second gear having a drum portion thereon, and a substantially endless cable or wire connected to said carrier and partially wound on said drum portion of said second gear so as to move said carrier when said motor is energized.

8. A printer as claimed in claim **1**, wherein said print head is disposed for pivotal motion about a horizontal axis extending in parallel with said platen between an operative position in which said print head is pressed against said platen and a first inoperative position in which said print head is spaced from said platen, said print head coupled to said means for actuating said first and second clamp means, said actuating means pivoting said print head to the print head operative position when actuated to said first actuating position and said actuating means pivoting said print head to the first print head inoperative position when actuated to said second actuating position.

9. A printer as claimed in claim **8**, wherein said first clamp means comprises a pivotal lever having a first clamping face thereon, and stationary means defining another clamping face cooperable with said first clamping face of said pivotal lever for clamping the print ribbon therebetween.

10. A printer as claimed in claim **8**, wherein said second clamp means includes a fixed member mounted on said carrier, a first lever mounted for pivotal motion between an operative position in which said first lever cooperates with said fixed member to clamp a portion of the print ribbon therebetween and an operative position spaced from said fixed member, a spring urging said first lever into said operative position thereof, and a second lever pivotally mounted on said carrier adjacent said fixed member and disposed such that when said print head is in said operative position thereof, said second lever allows said first lever to be in said operative position thereof under the urging of said spring, but when said print head is in said first inoperative position thereof, said second lever is engaged with said print head and said first lever to hold said first lever in said inoperative position against the urging of said spring.

11. A printer as claimed in caim **10**, wherein said print head is further movable to a second print head inoperative position which is spaced further from said platen than said first print head inoperative position, and said first lever of said second clamp means is disposed to be engaged, when said print head is moved to said second print head inoperative position, by said print head and brought to said second print head inoperative position, thereby allowing threading of a print ribbon through said first and second clamp means.

12. A printer as claimed in claim **11**, wherein said means for actuating includes a manually operable lever for selectively positioning said print head to said operative and first and second inoperative print head positions.

13. A printer as claimed in claim **8**, wherein said means for actuating includes a bail mounted for pivotal motion about said horizontal axis and operatively associated with said print head to move said print head between said print head operative and first print head inoperative positions, means for urging said bail to move said print head to said print head operative position, and electromagnetic means connected to said bail and energizable to bring and hold said print head to said

first print head inoperative position against the urging of the urging means.

14. A printer as claimed in claim **1**, wherein said first and second axes of said first and second ribbon driving means are located adjacent each other and one of said first and second ribbon driving means is operatively connected to said drive means by way of the other of said first and second ribbon driving means.

15. A printer as claimed in claim **14**, wherein said ribbon feed mechanism further comprises a ribbon cassette in which said supply and takeup spools are contained, and means on said stationary section for supporting said ribbon cassette in position relative to said first and second ribbon driving means, said ribbon cassette having a face thereon which cooperates with a movable member of said first clamp means to clamp a portion of the print ribbon therebetween.

16. In a printer having a stationary section, a platen on said stationary section, a bidirectional carrier drive means on said stationary section, a carrier operatively connected to said drive means for back and forth translatory movement thereby to and from a left margin position along said platen, a print head mounted for translatory movement together with said carrier, and a ribbon feed mechanism including a supply spool and a takeup spool for feeding a print ribbon past said print head, the improvement wherein said ribbon feed mechanism comprises:

first clamp means mounted on said stationary section and having opposed first clamp surfaces selectively actuatable between a clamped position in which said opposed first clamp surfaces are resiliently biased together to clamp a first portion of the print ribbon therebetween and a released position in which said opposed surfaces are spaced apart from one another to unclamp the print ribbon therebetween;

second clamp means connected to said carrier and having opposed second clamp surfaces selectively actuatable between a clamping position in which said opposed second clamp surfaces are resiliently biased together to clamp another portion of the print ribbon between said supply spool and said first portion of the print ribbon and a released position in which said opposed second clamp surfaces are spaced apart from one another to unclamp the print ribbon therebetween; and

means for selectively actuating said first and second clamp means and operable throughout the range of back and forth translatory movement of the carrier between a first actuating position in which said first clamp means and said second clamp means are actuated to respective clamped and released positions or a second actuating position in which said first and second clamp means are actuated to respective released and clamped positions.

17. The printer as claimed in claim **16**, wherein said print head is movably mounted on said carrier for movement between a printing position in which said print head is biased against said platen and non-printing position in which said print head is spaced away from said platen, said print head connected to said means for actuating and moved thereby to said printing position when said means for actuating is in said first actuating position and moved thereby to said non-printing position when said means for actuating is in said second actuating position.

18. The printer of claim **17** wherein said means for selectively actuating further comprises:

an electromagnetic actuator selectively operable for operating said means for actuating between the first and second actuating positions.

19. The printer of claim **17** further comprising:

first ribbon driving means disposed for rotation about a first axis fixed relative to said stationary section and operatively connected to said carrier drive means for impositively driving said supply spool to wind the print ribbon onto said supply spool when said carrier drive means operates to move said carrier toward said left margin position and for unwinding the print ribbon therefrom when said carrier drive means operates to move said carrier away from said left margin position; and

second ribbon driving means disposed for rotation about a second axis fixed relative to said stationary section and operatively connected to said carrier drive means for impositively driving said takeup spool to wind the print ribbon onto said takeup spool when said carrier drive means operates to move said carrier toward said left margin position and for allowing said takeup spool to unwind the print ribbon therefrom when said carrier drive means operates to move said carrier away from said left margin position.

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